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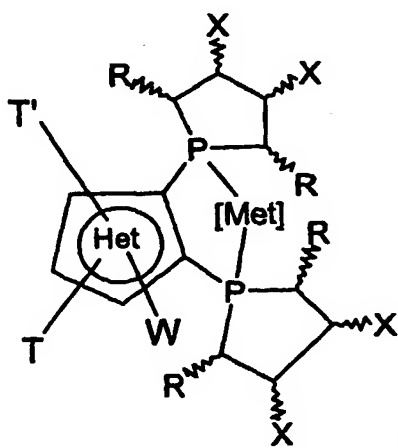
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(54) Title: METALORGANIC CATALYSTS FOR CHEMO-, REGIO- AND STEREoselective REACTIONS, AND CORRE-  
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(57) Abstract: Metallic catalysts of the general formula (I) and their precur-  
sors, suitable for chemo- regio- and stereoselective reactions, derived from or-  
tho- bis(1-phospholany)-heteroarenes. The new catalysts are characterized by  
the presence of two homomorphic phospholanic rings set in adjacent positions  
of an aromatic pentatomic heterocycle.

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/02160

## A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, CHEM ABS Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 03 031456 A (SOLVIAS AG ;BERENS ULRICH (DE)) 17 April 2003 (2003-04-17)  claims 9-13; examples 11-13,18,19	1-4, 11-14, 16,20-24
A	WO 99 24444 A (BERENS ULRICH ;CHIROTECH TECHNOLOGY LTD (GB)) 20 May 1999 (1999-05-20) cited in the application claim 2	1-24
A	US 5 329 015 A (BURK MARK J) 12 July 1994 (1994-07-12) cited in the application column 5, line 18 - line 30 column 6, line 5 - line 7	1-24
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- \*G\* document member of the same patent family

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>FERNANDEZ, ELENA ET AL: "Rationally designed improvement of the bis(phospholano)ethane ligand for asymmetric hydrogenation leads to a reappraisal of the factors governing the enantioselectivity of Duphos catalysts" CHEMICAL COMMUNICATIONS (CAMBRIDGE) (2000), (17), 1663-1664 , XP002255677 figure 4; table 1</p> <p>-----</p>	1-24

# INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 03031456	A	17-04-2003	WO 03031456 A2	17-04-2003
WO 9924444	A	20-05-1999	AT 206128 T	15-10-2001
			AU 1041099 A	31-05-1999
			CA 2307192 A1	20-05-1999
			DE 69801841 D1	31-10-2001
			DE 69801841 T2	16-05-2002
			EP 1028967 A1	23-08-2000
			ES 2162473 T3	16-12-2001
			WO 9924444 A1	20-05-1999
			JP 2001522855 T	20-11-2001
			US 6545183 B1	08-04-2003
US 5329015	A	12-07-1994	US 5171892 A	15-12-1992
			US 5386061 A	31-01-1995
			US 5565593 A	15-10-1996
			US 5559267 A	24-09-1996
			US 5596114 A	21-01-1997
			US 5532395 A	02-07-1996
			AT 153667 T	15-06-1997
			DE 69220061 D1	03-07-1997
			DE 69220061 T2	11-09-1997
			EP 0592552 A1	20-04-1994
			ES 2103953 T3	01-10-1997
			HK 1001060 A1	22-05-1998
			JP 6508848 T	06-10-1994
			WO 9301199 A1	21-01-1993